Temporary Field Storage of Solid Manure or Other Agricultural Source Material

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Factsheet

ORDER NO. 10-039 AGDEX 625/252 MAY 2010

Replaces OMAFRA Factsheet 05-009, *Temporary Field Storage of Solid Manure or Prescribed Materials*

INTRODUCTION

Ontario Regulation 267/03 ("Regulation") made under the Nutrient Management Act, 2002 (NMA) contains many provisions that apply to those farms required to have a Nutrient Management Strategy (NMS) or Nutrient Management Plan (NMP). Large farms with ≥300 nutrient units (NU) and farms with >5NU — that since December 31, 2005 need a building permit for livestock housing or manure storage — are required to have one or both of these documents.

These operations must, with some exceptions, now be able to store their manure for 240 days. For solid manure this can be achieved by adding the days of **all** storage available including:

- permanent storage (e.g. 3-walled concrete storage)
- in-barn storage (e.g. manure pack under animals)
- using a broker to periodically remove manure
- temporary field storage (Figure 1)

For example a chicken broiler farmer would meet 240 days if the farmer:

- builds permanent storage that holds 180 days of solid manure production from the barn and
- stores at least 60 more days of manure production in a proper temporary field storage, prior to land application

While temporary field storage creates flexibility for farmers, it must be done properly to reduce the potential for surface or groundwater contamination.

Figure 1. Temporary field storage of manure in a vineyard.

Are you aware of Ontario's Nutrient Management Act and Other Legislation?

The provincial Nutrient Management Act (NMA) and the Regulation 267/03 regulates the storage, handling and application of nutrients that could be applied to agricultural cropland. The objective is to protect Ontario's surface and groundwater resources.

Please consult the regulation and protocols for the specific legal details. This Factsheet is not meant to provide legal advice. Consult your lawyer if you have questions about your legal obligations.

For more information on the NMA call the Nutrient Management Information Line at 1-866-242-4460, e-mail *nman@omafra.gov.on.ca* or visit www.omafra.gov.on.ca.

Factsheets are continually being updated so please ensure that you have the most recent version.

Ministry of Agriculture, Food and Rural Affairs

Ontario

KNOW ONTARIO'S NMA AND OTHER LEGISLATION

The provincial Nutrient Management Act, 2002 and Regulation regulates the storage, handling and application of nutrients that could be applied to agricultural cropland. The objective is to protect Ontario's surface and groundwater resources. Part VIII, s. 82–86 of the Regulation outlines the standards for Temporary Field Nutrient Storage Sites.

WHAT IS DEFINED AS SOLID?

Solid, in relation to prescribed materials or nutrients, is: '...having a dry matter content of 18 per cent, or more, or a slump of 150 mm, or less, using the (slump test) set out in Schedule 9 to Regulation 347 made under the Environmental Protection Act...'

To most farmers, 'solid prescribed materials' means 'solid manure' that contains bedding such as straw, peat moss, shavings, sawdust or other materials that binds it so it can be stacked and handled with loaders.

There are three ranges of dry matter content of solid prescribed materials dealt with in the requirements for temporary storage in the Regulation. Table 1 gives examples of these ranges.

Table 1. Ranges of Dry Matter Defined in Regulation

Greater than 50% dry matter	• All poultry on litter, such as broilers, broiler breeders, layer pullets, turkeys • Dehydrated greenhouse vines
Greater than 30%, but less than 50% dry matter	• Beef cows and calves on bedding • Goats, sheep, rabbits on bedding • Horses[1] on bedding • Cured compost
18%–30% dry matter	• Laying hens in cages; belts or deep pack • Dairy operations on bedding • Beef feeders on bedding • Spent mushroom substrate • Beef feeders[1] on deep-bedded pack • Dairy operations[1] on deep-bedded pack • Hog operations[1] on deep-bedded pack • Mushroom stumps[2] • Asparagus butts[2] • Culled potted plants[2]

1. Adding bedding to manure increases dry matter, so this manure could realistically move to a drier category.
2. Agricultural-source materials less than 18% dry matter, but which pass the 'slump test', should be considered in this range for the purpose of the Regulation.

Table 2. Differences Between Temporary Field Storage and Permanent Storage

	Permanent Storage	Temporary Field Storage
Storage period	Long-term, usually 240–400 days or more	Short-term, 24 hours to 300 days maximum
Proximity to barn	Usually beside the barn where manure produced	Usually far from the barn in or near fields cropped
Walls	Usually concrete walls, but not always	Usually no walls, but bales can work temporarily
Floor	Usually concrete floor, but not always	Just the original field soil surface in a dry area
Location	Always in same place, beside barn/ road access	Changes from field to field as part of the crop rotation

DETERMINING THE MAXIMUM DAYS OF TEMPORARY STORAGE AT ONE LOCATION

The Regulation applies if nutrients are stored in a temporary field storage site for longer than 24 hours. Allowable days of temporary storage are based on 10 site characteristics and best management practices. Farmers are 'rewarded with days of temporary field storage' for methods protecting surface and groundwater.

Table 5 in the centre of this Factsheet lists the 10 site characteristics and best management practices, how each is used to cumulatively determine the maximum allowable time of field storage at each site and the rationale. The storage period is linked to relative environmental risk to surface and groundwater.

The total number of days is cumulative, but cannot exceed 300 days. This applies for solid manure and other agricultural source materials.

Even though rules on temporary field storage only apply to farmers required to prepare a NMS or NMP, it is hoped farmers who are not required to prepare these plans will still adhere to the concepts of the site-scoring system. This will help ensure temporary field storage of solid manure and other prescribed materials do not contribute unnecessarily to surface or groundwater contamination.

Table 3. Minimum Management Requirements under the NMA Regulation

The Regulation outlines several *minimum* management requirements for storage sites. Rationales are shown in italics.

MINIMUM MANAGEMENT REQUIREMENTS	***RATIONALE***
A farmer who receives and stores nutrients on site cannot receive and store more nutrients than is expected to be used for crop production on that farm unit in that operating year.	*Storage piles should be size-appropriate for the field; a temporary pile is truly temporary when it is used on the field where it is placed.*
If more than one type of nutrient is stored on site, the nutrients must be managed in accordance with the most restrictive requirements applicable to any of the nutrients stored in the site.	*See example 4 to follow.*
If the site is located in an area that is tile-drained, there must be a contingency plan to deal with any contaminated liquid that might get into the tiles.	*Farmers must be prepared to deal with runoff getting into tile drains. Proving there are, or aren't, tiles under or near a temporary storage site can be difficult. Some ideas include: checking aerial photos of the field; looking for nearby tile outlets; observing the first spots to drain in spring; or asking previous owners and local drainage contractors. Probing at least 1 m deep in more obvious locations for tiles with a metal rod can help, but this is difficult over large areas.*
Nutrients must not be stored on site for longer than the maximum time allowed for each nutrient.	*If there is more than one temporary field storage on the farm in different locations, each one might have a different allowable maximum time at that site based on the scoring system for that site.*
The site may be used again the following year if, following the removal of nutrients from the surface after the site ceases to be in use each year, a minimum of 75% vegetative cover is re-established on the site.	*To be used consecutively for temporary field storage, vegetation must be able to grown again on the area. This can prove difficult when the same site is used annually.*
The operator shall provide a sketch of the site showing setback distances, as described earlier, and maintain records for all temporary field storage sites, which include the dates the site was: • established, then removed • displaced, mixed or inverted, if applicable.	*The more information in the sketch, and the more details on management, the better.*

Table 4. Minimum Site Requirements under the NMA Regulation

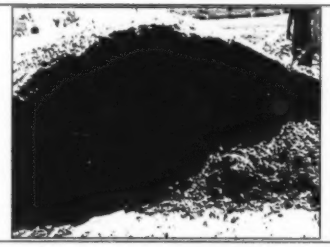
The Regulation outlines *minimum* site requirements related to location. Rationales are shown in italics

MINIMUM SITE REQUIREMENTS	***RATIONALE***
The **minimum** depth of unconsolidated soil[1] to bedrock, under the site and within 3 m of the side of the site, must be 0.3 m.	*This minimizes the potential for runoff to reach bedrock under, or near, a temporary storage site.*
The **minimum** depth of soil above the water table[2], under the site and within 3 m of the side of the site, must be 0.9 m.	*This minimizes potential for runoff to reach the water table under, or near, a temporary storage site.*
Nutrients must **not** be stored on soils with a hydrological soil group of "A" unless the depth to soil is greater than 0.9 m to bedrock.	*"Hydrologic soil group A" means a soil with rapid infiltration rates as defined by the Drainage Guide for Ontario. There are very few locations in Ontario with these conditions, but if it is suspected, use a metal rod to probe down at least 1 m to check for possible shallow bedrock.*
The storage site must **not** be located in an area that, according to the flood plain mapping provided by the municipality or conservation authority is subject to flooding more than once every 100 years.	*Storage sites with the potential for flooding are inappropriate. Confirm with the conservation authority that the proposed temporary storage is not in a 1 in 100 year flood plain.*
The site must **not** have a slope greater than 3%.	*3% is a vertical drop of 3 m every 100 m distance. Runoff moves quickly on relatively steep slopes.*
There must be a flow path that is at least 50 m to the nearest surface water **or** tile inlet, and located at least 0.3 m above bedrock.	*Flow path is defined in the* Regulation *as 'a surface channel or depression that conducts liquids away from the area'.*
Do **not** locate the site within: • 45 m of a drilled well that has a depth of at least 15 m and a watertight casing to a depth of at least 6 m below ground level • 90 m of any other well, other than a municipal well • 100 m of a municipal well • 125 m of a single residence, or within 250 m of a residential area if the area is used for storing agricultural source material.	*Setbacks help minimize risks to drinking water, and are greater than those required for permanent storages since there is more risk of runoff.*

1. Unconsolidated soil has not been compacted, other than through normal field traffic and cultivation.
2. Water table is defined in the Regulation as 'In relation to land, the highest level of water found in the ground, as recorded in the water well records for the nearest water wells to the land, or as determined by a test hole dug at or before the placing of materials containing nutrients at a temporary storage site located on the land.'

Table 5. Temporary Field Storage of Solid Manure or Other Agricultural Source Material Site-Scoring System

Item	Management Techniques & Field Conditions for Materials Stored in a Temporary Field Nutrient Storage Site		Days	Your Farm	Rationale
1	**% Dry Matter**	Nutrients stored in the site have a dry matter content of • 50% or more	+60		The higher the dry matter of manure, the more rainfall it can absorb. Poultry farmers with manure >50% dry matter know this when they remove piles and see that rainfall only penetrates up to 125 mm under the surface, as in the picture shown. Wetter manure sheds rainfall off the sides, or lets it soak through and into the soil. Keeping the pile as 'flat' as possible on top helps force the rainfall to soak in and prevent runoff.
		• 30% or more, but less than 50%	+30		
		• 18%, or more, but less than 30% (includes horticultural culled materials)	+0		
2	**% N and % P Added Together**	The % of total nitrogen combined with the % of total phosphorus, both on a wet basis, is: • less than 0.8%	+60		The lower these two nutrients are in manure when placed, the lower the environmental risk if there is runoff. There is a broad range of nutrient contents in solid manure related to species and diet. The table opposite lists average nutrient contents by dry matter range in the NMAN database for many animals. Manure might vary depending on bedding.
		• at least 0.8%, but less than 1.6%	+30		
		• 1.6%, or more	+0		
3	**Drainage Tile and Bedrock Location**	There are **no** field drainage tiles at any depth of the soil surface and **no** bedrock within 0.9 m of the soil surface, located: • under the site • within 3 m of the perimeter of the site or • within the first 50 m of the flow path to surface water	+0		If runoff from the pile sides, or leachate through the middle of the temporary field storage occurs, there is less environmental risk if the contaminated water has no conduit for travel to surface or ground water. Conduits can be provided by tile or bedrock under, near, or in the first part of the flow path away from the pile. Most Ontario farms are tiled and many have bedrock near the surface. It is natural to assume, since this a dry place for machinery, that this is a good place to store manure. However, the Regulation encourages farmers to **avoid these locations** by 'taking away' days of storage on sites with these conditions.
		There are field drainage tiles at any depth of the soil surface or bedrock within 0.9 m of the soil surface, located: • under the site • within 3 m of the perimeter of the site or • within the first 50 m of the flow path to surface water	–60		
4	**Soil Type Under the Site**	The site is situated on soil included in the following hydrologic soil groups as defined by OMAFRA Publication 29, *Drainage Guide for Ontario:* • B,C or D	+30		The heavier the soil under a temporary field storage the less opportunity for leachate to percolate down to the groundwater. Clay soils are denser and better at preventing downward percolation than lighter, coarser soils one might find in a peach



Manure	18–30% DM	30–50% DM	> 50% DM
Poultry	2.0%	2.8%	4.4%
Swine	1.4%	1.3%	NA
Beef	0.8%	1.3%	NA
Sheep	0.9%	1.0%	1.6%
Cattle	0.8%	0.9%	NA

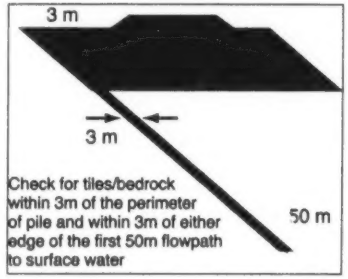
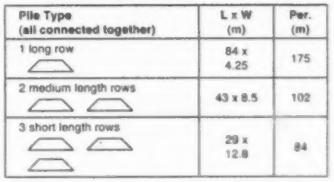

3 m
3 m
Check for tiles/bedrock within 3m of the perimeter of pile and within 3m of either edge of the first 50m flowpath to surface water
50 m

Table 5. Temporary Field Storage of Solid Manure or Other Agricultural Source Material Site-Scoring System

Item	Management Techniques & Field Conditions for Materials Stored in a Temporary Field Nutrient Storage Site		Days	Your Farm	Rationale
4	**Soil Type Under the Site**	The site is situated on soil included in the following hydrologic soil groups as defined by OMAFRA Publication 29, *Drainage Guide for Ontario:* • B,C or D	+30		orchard such as the one in the picture opposite.
		• A	+0		
5	**Perimeter of the Site**	The outer edge of the site (of all piles), at the ground surface, has a perimeter of • less than 100 m	+30		Piles with a more square and compact footprint will soak up more rainfall than piles of equivalent volume but with a longer and narrower shape since they have less total side perimeter for runoff. The table opposite shows the perimeter of three piles, all storing 100 tonnes of solid chicken broiler manure, stored 1.2 m deep (4 ft) when dumped from a truck, with one long, two medium, or three short rows of piles. 
		• 100 m or more	+0		
6	**Covers and Tarps**	The site is covered with a rain-shedding tarp that: • has been anchored against wind removal • has been placed on site the same day on which the first materials were placed, and • remains in place for the entire storage period	+120		Tarps prevent contaminated runoff since rainfall does not touch the manure. However, tarps are unpopular because they are inconvenient and difficult to anchor against wind removal. Breathable tarps, such as the (partial) one shown opposite in a compost turning system, are recommended (also see *Examples 5 and 6*).
		Site **not** covered with rain-shedding tarp	+0		
7	**Distance to Surface Water**	The site has a flow path to the nearest surface water or water inlet for field tile drainage of: • 150 m or more	+30		If runoff does occur, there is less environmental risk if the runoff has to travel a long distance to surface water **or** to a water inlet for field tile drains. Surface water is defined in the Regulation. Water inlets for field tile drains, such as water and sediment control basins that collect and drain floodwaters (opposite), are **not** surface water under the Regulation, but temporary field storages still should **not** be near them.
		• at least 50 m, but less than 150 m	+0		
8	**Location of the Site**	The site is situated on the same location, or within 125 m of the same location: • not more often than once every 3 years	+60		When temporary field storage is in the same location year after year this is considered permanent storage. This causes a build-up of soil nutrients and can render the site uncroppable. Size

Pile Type (all connected together)	L x W (m)	Per. (m)
1 long row	84 x 4.25	175
2 medium length rows	43 x 8.5	102
3 short length rows	29 x 12.8	84

Table 5. Temporary Field Storage of Solid Manure or Other Agricultural Source Material Site-Scoring System

Item	Management Techniques & Field Conditions for Materials Stored in a Temporary Field Nutrient Storage Site		Days	Your Farm	Rationale	
8	**Location of the Site**	The site is situated on the same location, or within 125 m of the same location: • not more often than once every 3 years	+60		piles appropriately to fields and move where needed for the crops. Piles on the ground behind the barn, as shown opposite, are **not** temporary field storages.	
		• more often than once every 3 years	+0			
9	**Materials Removed from Site**	The site is not situated on the same location, or within 125 m of the same location, more often than once every 3 years, **and** the materials stored are removed from the site and applied to land during the period between August 15 and October 15 in any year.	+60		Many farmers want to spread manure during the drier and later time of summer and early fall, such as after wheat is harvested (picture opposite). During this time, there is usually more evaporation of moisture than is being replaced by rainfall, so there is reduced risk of runoff. The Regulation provides an incentive for temporary field storage manure that will be spread during this drier season, as long as it is also being located on different sites yearly, as in a crop rotation.	
		The situation described above does not apply to the site	+0			
10	**Turning of Stored Materials**	The pile of materials stored on site: • has dry matter between 25% and 60%, and • has C:N ratio between 20:1 and 40:1, and • is turned so that every piece of material in pile is displaced from its former position and mixed or inverted once weekly for the first 3 weeks, and once monthly after that	+120		An increasing number of farmers compost their solid manure for use on their cropland, such as shown opposite. Long windrows of manure with a lot of straw or wood shavings in them are placed in the field, then turned often to mix and introduce oxygen. This improves the compost process, but also dries the piles and breaks up surface crusting, allowing the piles to act as sponges for most rainfall that lands.	
		The site described above does not apply	+0			
Total Score		**Add the totals in the column for 'Your Farm'**			**Maximum allowable consecutive days of temporary field storage at this location**	

Example 1

A temporary field storage for horse manure to be spread on a corn field has these 10 characteristics:

#	Characteristics	Example 1	Days
1	% dry matter	38%	+30
2	% N added to % P	0.75%	+60
3	Tiles/bedrock under/nearby	none	+0
4	Soil type	clay (D)	+30
5	Perimeter of pile	60 m	+30
6	Cover	none	+0
7	Distance to surface water	200 m	+30
8	Location of site	every year	+0
9	Removal date	May	+0
10	Turning of pile	not turned	+0
Total maximum days allowed at this site			**+180**

So, the maximum time horse manure can remain at this site is 180 days. One simple way to increase this is to locate this temporary storage on a site not used for temporary field storage in the last two years.

Example 2

A temporary field storage for chicken broiler manure in a vineyard has these characteristics:

#	Characteristics	Example 2	Days
1	% dry matter	62%	+60
2	% N added to % P	3.4%	+0
3	Tiles/bedrock under/nearby	tile present	–60
4	Soil type	clay (D)	+30
5	Perimeter of pile	50 m	+30
6	Cover	None	+0
7	Distance to surface water	300 m	+30
8	Location of site	every year	+0
9	Removal date	June	+0
10	Turning of pile	not turned	+0
Total maximum days allowed at this site			**+90**

So, the maximum time chicken manure can remain at this site is 90 days. Two ways to increase this would be to locate this temporary storage on a site not used for temporary field storage in the last two years, and one without tiles under it.

Example 3

A temporary field storage, for beef manure to be spread on a corn field has these characteristics:

#	Characteristics	Example 3	Days
1	% dry matter	32%	+30
2	% N added to % P	1.2%	+30
3	Tiles/bedrock under/nearby	None	+0
4	Soil type	clay (D)	+30
5	Perimeter of pile	150 m	+0
6	Cover	None	+0
7	Distance to surface water	500 m	+30
8	Location of site	once/3 yrs	+60
9	Removal date	September	+60
10	Turning of pile	not turned	+0
Total maximum days allowed at this site			**+240**

So, the maximum time beef manure can remain at this site in temporary field storage is 240 days.

Example 4

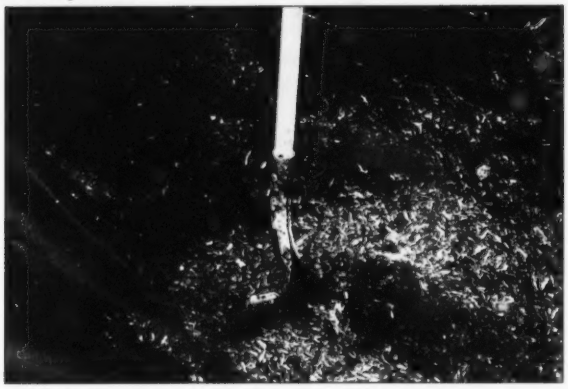
A temporary field storage of manure is turned frequently and composted in windrows.

#	Characteristics	Example 5	Days
1	% dry matter (use most restrictive one)	25% swine 40% cattle	+0
2	% N added to % P (use most restrictive one)	1.4% swine 1.2% cattle	+30[1]
3	Tiles/bedrock under/nearby	Tile present	–60
4	Soil type	Loam (B)	+30
5	Perimeter of pile	300 m	+0
6	Cover	None	+0
7	Distance to surface water	500 m	+30
8	Location of site	Once/5 yrs	+60
9	Removal date	May	+0
10	Turning of pile	C:N is 30:1	+120[2]
Total maximum days allowed at this site			**+210**

1. The most restrictive manure type must be considered when determining the score for the % Dry Matter and the % N added to % P, regardless of the relative volume of each.
2. The C:N ratio of the mixture is at the time of placement, as the C:N ratio will decrease over time as composting proceeds.

To increase storage time above 210 days find a location without tiles under it. This would increase storage time to 270 days, which for most windrow composting systems is sufficient time to allow proper composting and curing before field application.

Example 5



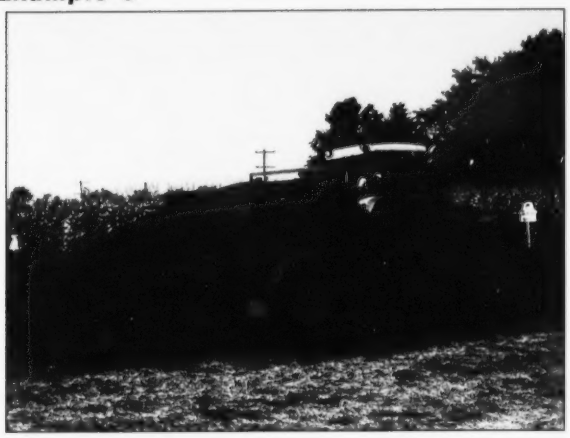
After cleaning the manure out of a broiler-breeder pullet barn, a breathable rain-shedding tarp (shown here cut open, revealing dry manure underneath) is applied immediately. The resulting temporary field storage has the following characteristics:

#	Characteristics	Example 6	Days
1	% dry matter	40%	+30
2	% N added to % P	3.0%	+0
3	Tiles/bedrock under/nearby	none	+0
4	Soil type	clay (B)	+30
5	Perimeter of pile	75 m	+30
6	Cover	yes	+120
7	Distance to surface water	250 m	+30
8	Location of site	once/5 yrs	+60
9	Removal date	September	+60
10	Turning of pile	not turned	+0
Total days			**+360**[1]
But...total maximum days allowed at this site			**+300**

1. The maximum allowable days in one location is 300 days.

For all-in/all-out operations such as broiler-breeder pullets, it is easier to use a cover because once it is anchored in place it need not be removed until the manure is spread on the fields. This is difficult when manure is added more frequently.

Example 6



A temporary field storage of beef manure, composted in windrows, with a rain-shedding tarp that can be lifted and replaced during pile turning, has the following characteristics:

#	Characteristics	Example 8	Days
1	% dry matter	40%	+30
2	% N added to % P	1.3%	+30
3	Tiles/bedrock under/nearby	tile present	–60
4	Soil type	sand (A)	+0
5	Perimeter of pile	250 m	+0
6	Cover	yes	+120
7	Distance to surface water	75 m	+0
8	Location of site	once/2 yrs	+0
9	Removal date	May	+0
10	Turning of pile	C:N is 30:1	+120
Total maximum days allowed on this site			**+240**

So, even though this temporary field storage site is located on a light soil with tiles under it, the cover and turning of the pile help minimize the risk of contaminated runoff. However, it is still recommended sites avoid tiled areas if possible.

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ISSN 1198-712X
Également disponible en français
(Commande nº 10-040)